



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION IX  
75 Hawthorne Street  
San Francisco, Ca. 94105

February 12, 1991

MEMORANDUM

SUBJECT: Cleanup Levels for Lead-Contaminated Soils  
FROM: Elizabeth Reicher *ER* H-7-2  
TO: Jeff Rosenbloom, H-7-2

The following summarizes the results of my research into cleanup levels established for lead-contaminated soils. The documents reviewed include two OSWER directives, two pertinent OERR publications (including abstracts of almost 100 RODs), and several miscellaneous publications. A bibliography is presented at the end of this memorandum.

Review of National Cleanup Levels

In an article entitled "Standards for Soils Lead Limitation in the United States" (Chaney, R.L., and H.W. Mielke. 1986. Trace Subst. Environ. Health. 20:357-377, reviewed in Beyer, W.N. 1990. Evaluating Soil Contamination. U.S. Fish and Wildlife Service. Biological Report. 90(2).), the authors report that ingestion of lead-contaminated soil and dust by children is the principal health hazard posed by lead in soil. They estimate that the average blood lead concentration of children would increase by approximately 5 ug/dl for each 1,000 ppm lead in soil or dust from the environment. They conclude that substantially large areas where soil lead concentrations exceed 500 ppm should be cleaned up, and that for children at greatest risk, soil lead levels as low as 150 ppm could cause excessive blood lead concentrations.

The U.S. Fish and Wildlife Service reports in its publication "Evaluating Soil Contamination" the mean concentration of lead in soils and other surficial materials in the United States is 20 ppm. Additionally, they report that the range of lead in soils and other surficial materials in the United States is <10 - 700 ppm.

EPA has not published a cleanup standard for lead contaminated soils; however, OSWER issued a directive in September 1989 setting forth interim soil cleanup levels for total lead at 500 to 1,000 ppm. A second OSWER directive, issued in January 1990, reiterates that first directive was intended as guidance only, not as a regulation. Other federal-level guidelines reported include an ATSDR soil lead guidance of 500 - 1,000 ppm and a Center for Disease Control a guideline of 500 ppm for surface soils (to one foot in depth).

EPA has enforced (RCRA and CERCLA sites) soil cleanup levels for lead ranging from 100 ppm to 1,000 ppm. Table 1 tabulates the approximate breakdown of cleanup criteria reported. A review of the proposed RCRA Subpart S Corrective Action Regulations indicates that, although EPA has set many other soil cleanup levels, no values have been published yet for lead.

Several states have set action levels or cleanup objectives, including the following:

Maine	125 ppm	Health-based target
New Jersey	250 ppm - 1,000 ppm	Non-promulgated objective, based on a multiple of background
Kansas	1,000 ppm	Action level to protect groundwater
Minnesota	1,000 ppm	Interim soil lead standard

#### Review of International Cleanup Levels

Foreign environmental agencies have set soil cleanup levels that range from 20 ppm to as high as 2,600 ppm lead. The Japanese Environmental Administration established 600 ppm as the criteria for evaluating soil pollution on public land to protect human health. They reportedly derived this level from the mean value of lead in soils surveyed plus three times the standard deviation.

Holland and the state of Quebec utilize a three-tiered system initially developed by the Dutch as follows:

	Dutch Soil Cleanup Act (interim)	Quebec
Level A: Background or detection limit, no action required	50 ppm	50 ppm
Level B: Moderate contamination requiring additional study	150 ppm	200 ppm
Level C: Threshold values requiring additional cleanup	600 ppm	600 ppm

Ontario, Canada uses the following Soil Cleanup Criteria for Decommissioning Industrial Sites to protect human health:

For agricultural land	60 ppm
For residential and parkland	500 ppm
For commercial and industrial land	1,000 ppm

Additionally, soils in the vicinity of secondary lead smelters "should" contain less than 2,600 ppm lead, or cleanup is required. This level is based on health risks due to potential soil ingestion by children. Alberta, Canada has set a Soil Contaminant Guideline of 800 ppm as the acceptable level for lead in acidic soils (pH < 6.5).

The Soviet Union has reportedly determined that 20 ppm lead in soil is the concentration at which lead does not enter plants, water or air in amounts that exceed the maximum allowable concentration (MAC) for these media and at which lead has no adverse effects on the composition and biological properties of the soil. Accordingly, they have set 20 ppm as the MAC for soil.

### Conclusions

In summary, no standard has been set for cleanup of lead-contaminated soils. It is interesting to note that, only three of the thirteen sites with specific cleanup levels (as found in the ROD Annual Report) set levels above 500 ppm; only one set a level of 1,000 ppm. A cleanup level of 500 ppm is being enforced at four sites; this level was set on a risk basis in each case. A cleanup level of 250 ppm is being enforced at four sites -- all of these are in New Jersey and are subject to that state's non-promulgated soil lead guideline (250 ppm - 1,000 ppm). Finally, EPA is enforcing levels less than 250 ppm at four sites. At the three CERCLA sites the level was set based on risk; at the RCRA site the level is based on background soil lead levels.

Internationally, soil lead action levels appear to cluster around 500 - 600 ppm (but reported as high as 1,000 ppm for industrial areas). Levels of 150 ppm - 200 ppm are cited in several cases for initiation of additional investigations. No action levels, where set, are approximately 50 ppm.

In general, there seems to be a substantial number of cases where soil lead levels at or below 500 ppm are being enforced, despite the fact that current federal guidance supports setting levels as high as 1,000 ppm. Levels reportedly set based on human health and/or environmental risk ranged from 125 ppm to 640 ppm.

cc: Ray Seid, Hawaii Department of Health

### Bibliography

Beyer, W.N. 1990. Evaluating Soil Contamination. U.S. Fish and Wildlife Service. *Biological Report*. 90(2). 25 pp.

Longest, H.L. 1989. Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites. OSWER Directive #9355.4-02.

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Office of Emergency and Remedial Response, US EPA. 1989. Determining Soil Response Action Levels Based On Potential Contaminant Migration to Ground Water: A Compendium of Examples. EPA/540/2-89/057.

Office of Emergency and Remedial Response, US EPA. 1989. ROD Annual Report: FY 1989. EPA/540/8-90/006.

Resch, M.E., P.E. 1990. Summary of the Proposed RCRA Corrective Action Regulations. 8/16/90.

Unknown. 1990. Lead Cleanup - Company agrees to EPA levels at hazardous waste site. *Environmental Policy Alert*. 9/19/90.

TABLE 1

EPA Enforced Cleanup Criteria  
for Lead-Contaminated Soils

<u>Number of Sites</u>	<u>Cleanup Level</u>	<u>Basis</u>
5	Not specified	$\leq 10^{-6}$ excess lifetime cancer risk
3	Not specified	$10^{-4}$ - $10^{-6}$ excess lifetime cancer risk (One site specified 560 ppm to meet this criterion)
4	Not specified	$HI \leq 1$ (One site specified 500 ppm to meet this criterion)
3	Not specified	Residual soil lead levels must protect drinking water (MCL = 50 ug/l)
6	Not specified	Soil must meet EP-Tox, TCLP or LDR requirements
14	Site specific	Range of reported values: 125 - 1,000 ppm (see Table 2)
1	Site Specific	Background (RCRA settlement in Region V). Standard set at 100 - 150 ppm.

TABLE 2  
Specific Soil Lead Cleanup Levels  
Enforced by EPA<sup>1</sup>

<u>Specified Lead Cleanup Level (ppm)</u>	<u>Site</u>	<u>Basis</u>
100 - 150	Eljer Plumbingware, OH	(RCRA) Background
125	Saco Tannery Waste Pits, ME	Health-based State target level
166	Commencement Bay/Nearshore/ Tide Flats, WA	"Acceptable dose"
200	Beckman Instruments, CA	Human health/ en- vironmental risk
250	Burnt Fly Bog, NJ	State criteria for downstream sediments
250	Lipari Landfill, NJ	State soil cleanup criteria
250	Ringwood Mines/Landfill, NJ	Non-promulgated State soil cleanup objectives
250	DeRewal Chemical, NJ	State action level
500	Ordnance Works Disposal Areas, WV	Based on $10^{-6}$ excess cancer risk
500	Flowood, MS	Risk-based
500	Smith's Farm, KY	Based on $HI < 1$
500	United Scrap Lead, OH	Based on guidelines for surface soils ( $< 1'$ ) from Center for Disease Control, EP Tox level of 5 mg/l
560	Hebelka Auto Salvage Yard, PA	Health-risk based
640	Wells G & H, MA	Based on target blood level of 10 ug/dl
1,000	Cherokee County, KS	Action level to protect groundwater

<sup>1</sup> Based primarily on information found in the ROD Annual Report: FY 1989 (EPA/540/8-90/006) prepared by the Office of Emergency and Remedial Response, US EPA. 1989.